

Armed Forces College of Medicine
AFCM





White matter of cerebral cortex & Basal Ganglia

By

Prof. Dr.: Eman Habib

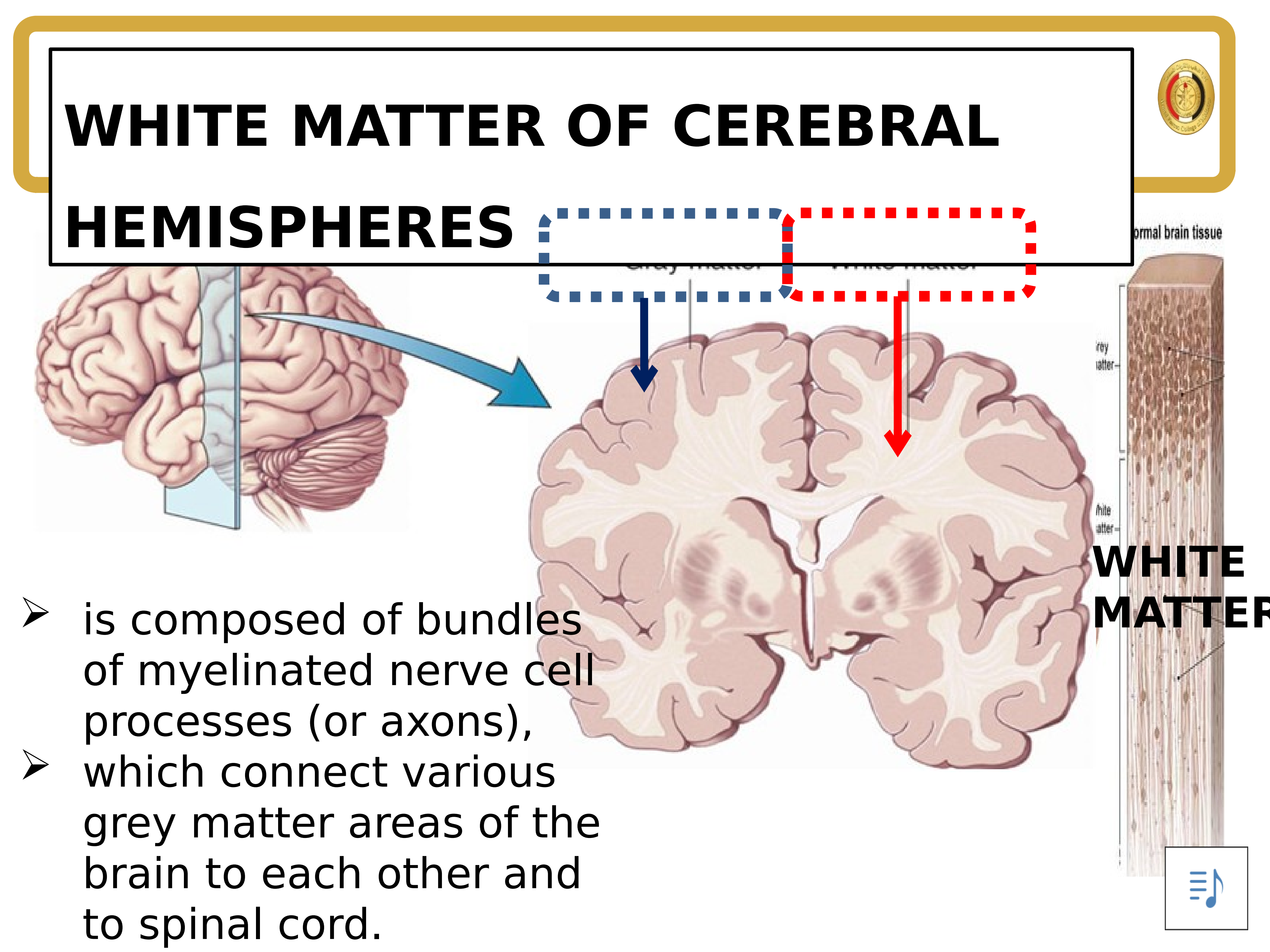


INTENDED LEARNING OBJECTIVES (ILO)

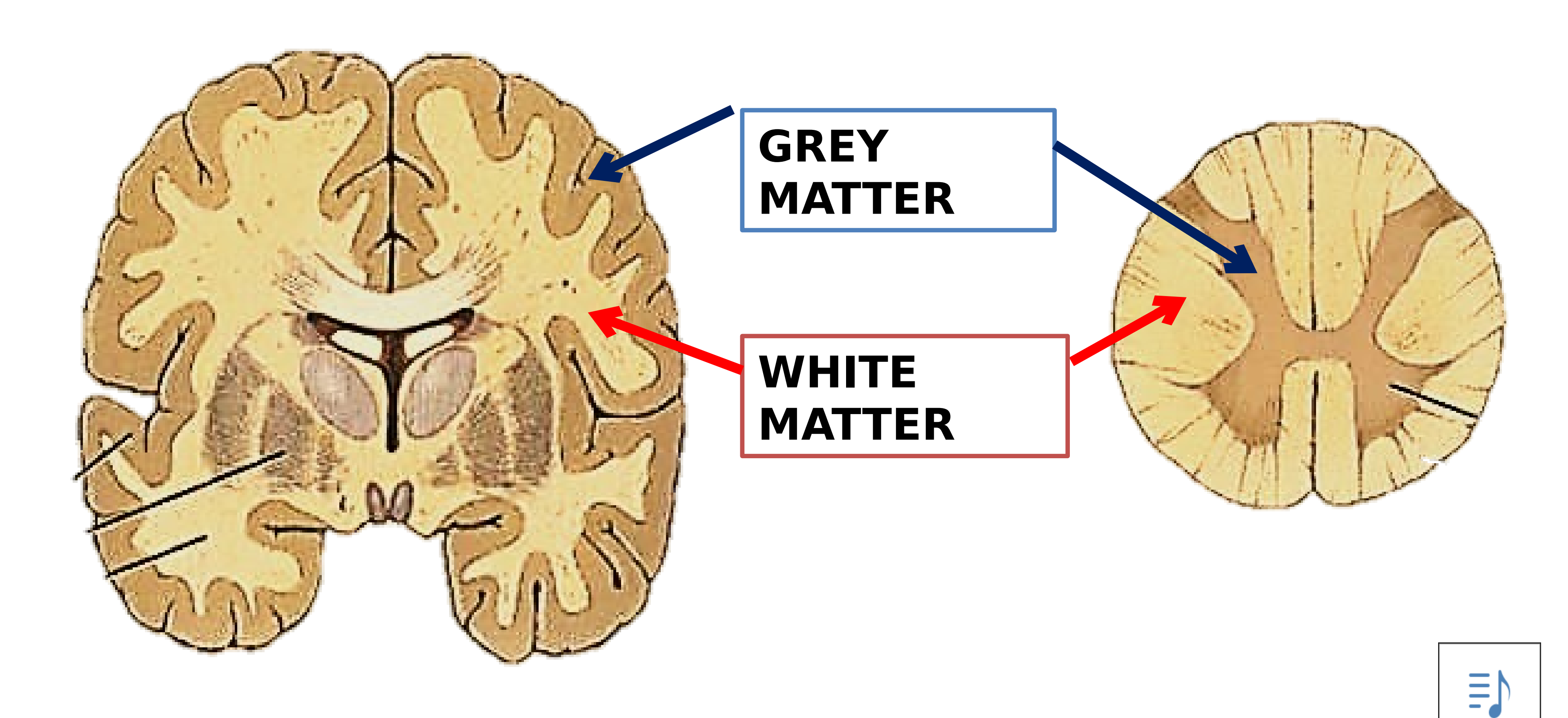


- **Define** types of white matter of the cerebral hemisphere.
- **List** major **association** bundles of the brain
- **Locate** the **internal capsule,** identify its different parts, fibers passing in each part& blood supply
- **List** commissural fibers of the brain.
- **Identify** parts of corpus callosum& their connections
- **Describe** the anatomy of **basal nuclei**.

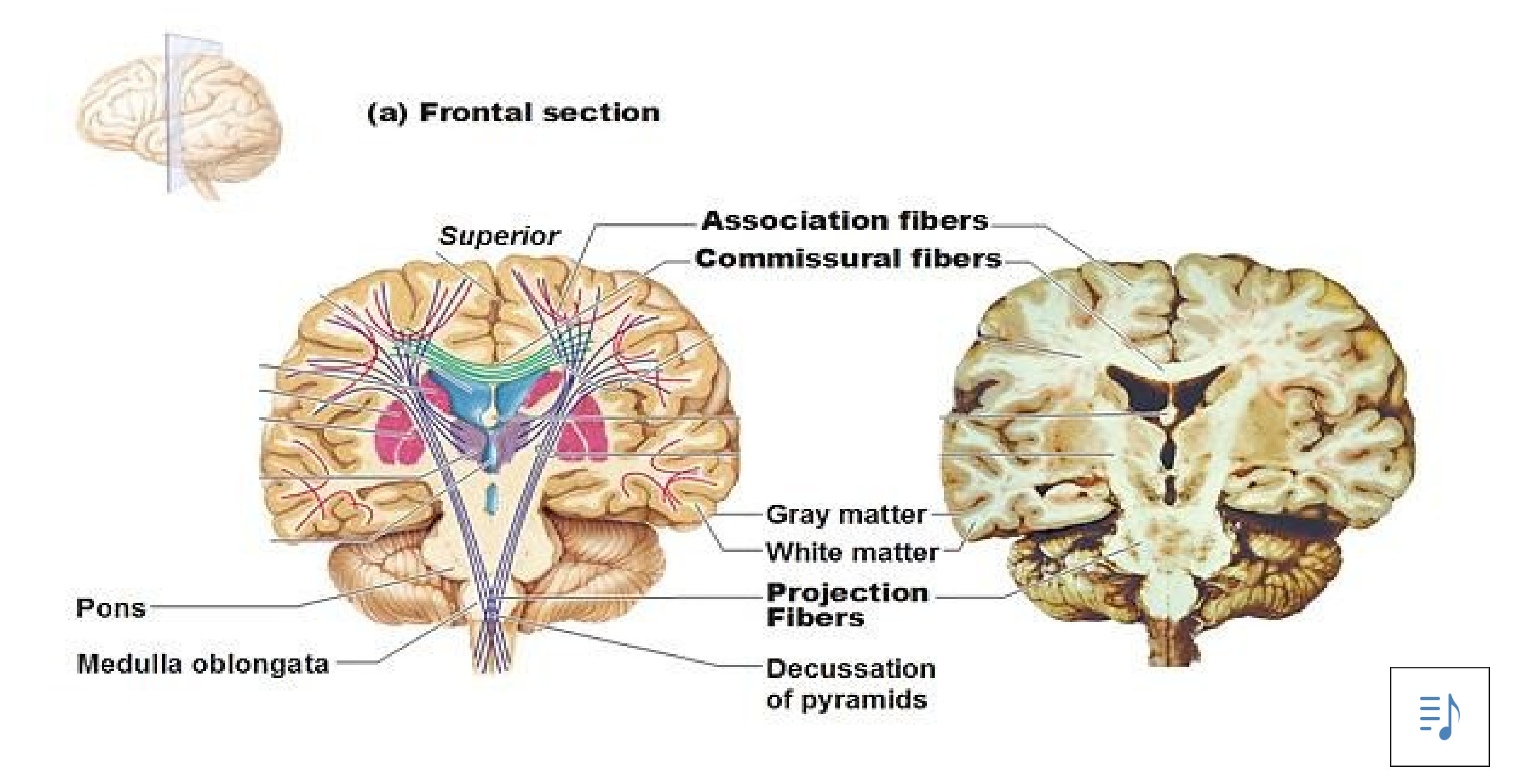



WHITE MATTER OF CEREBRAL HEMISPHERES
WHITE MATTER
➢ is composed of bundles of myelinated nerve cell processes (or axons),
➢ which connect various grey matter areas of the brain to each other and to spinal cord.

IFFERNCE BETWEEN WHITE MAT ER
EREBRAL HEMISPHERES & SPINAL C



TYPES OF WHITE MATTER



TYPES OF WHITE MATTER OF CEREBRAL HEMISPHERES :

projection fibers

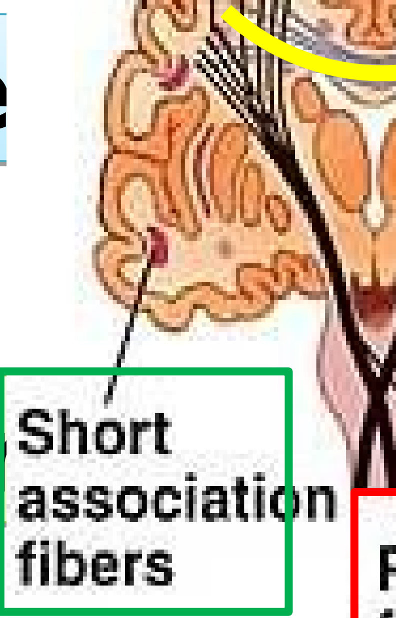
connect the cerebral cortex with lower centers

Commissural fibe

connect **the same area** in **the Two cerebral hemispheres**

Association fiber

Connect different parts of

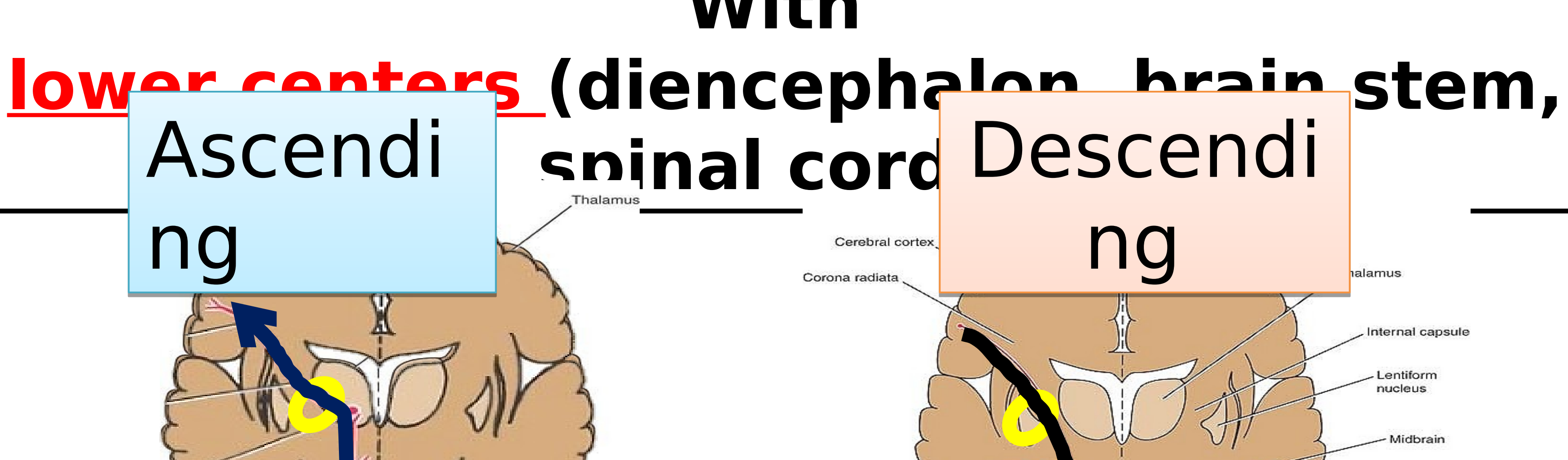


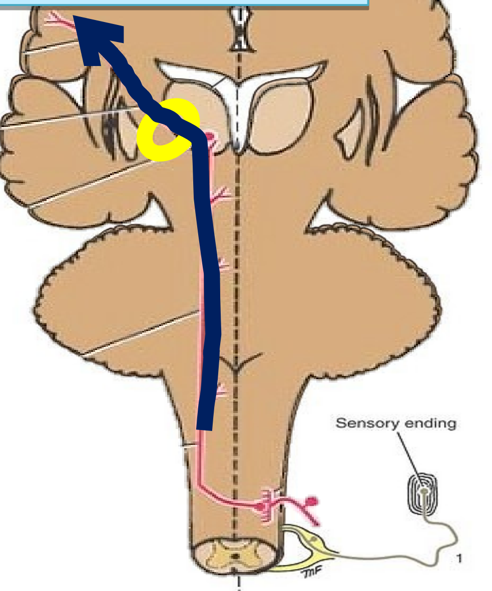


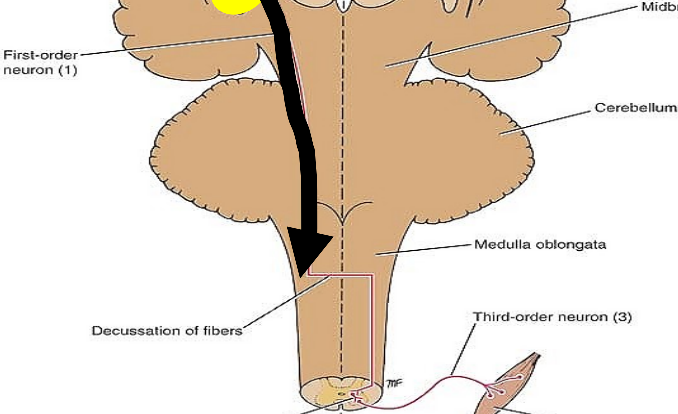
I- projection fibers



Include fibers that connect the <u>cerebral cortex</u>
With
<u>lower centers</u> (diencephalon, brain stem, spinal cord)



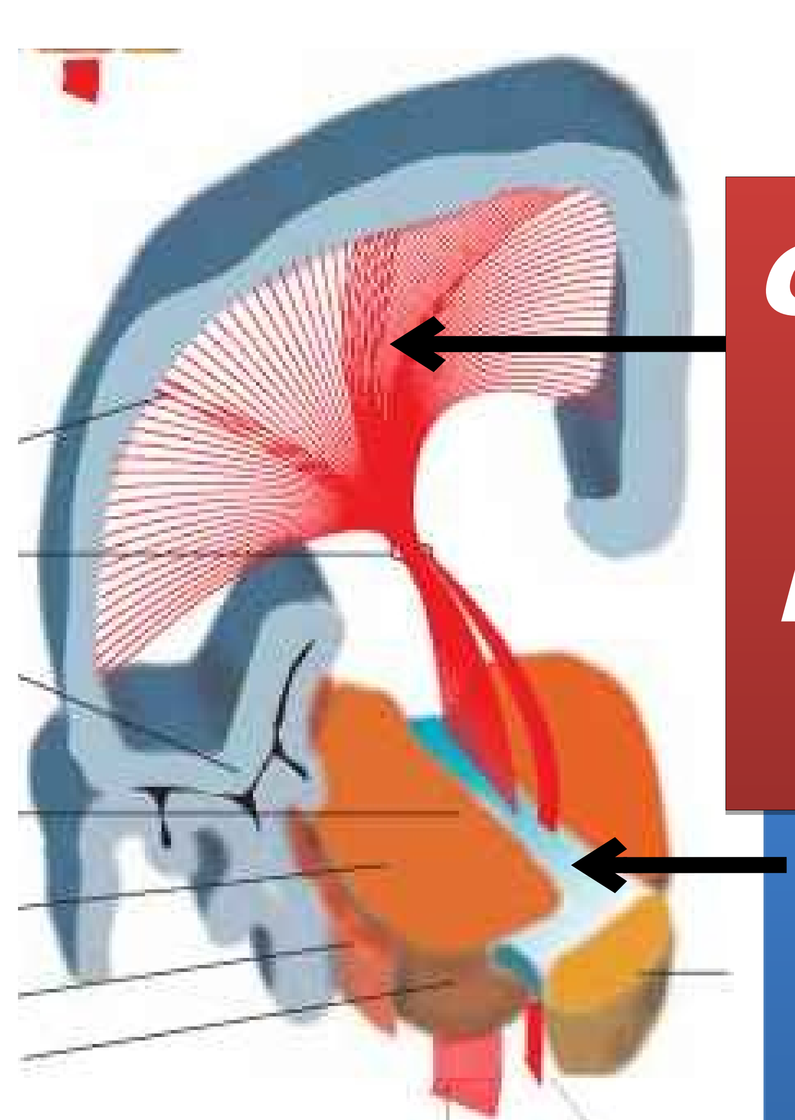




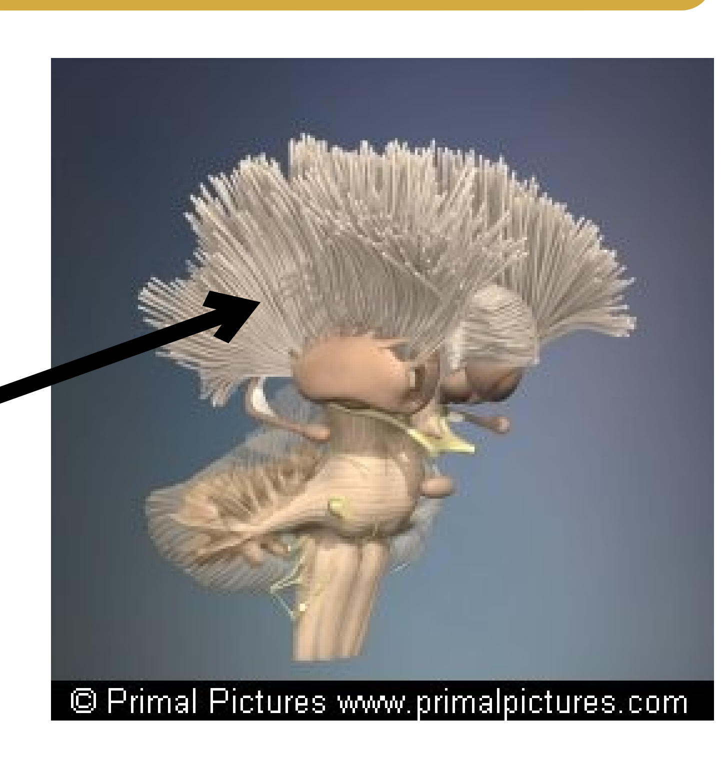


I- projection fibers

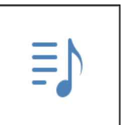




corona radiata

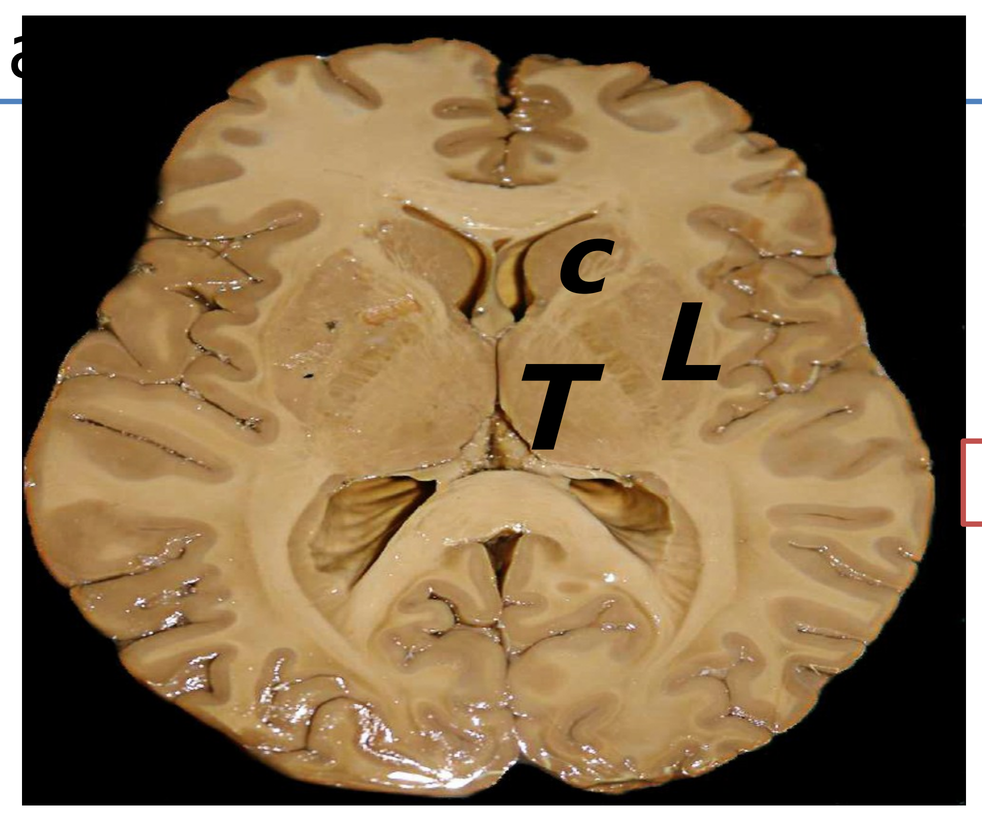


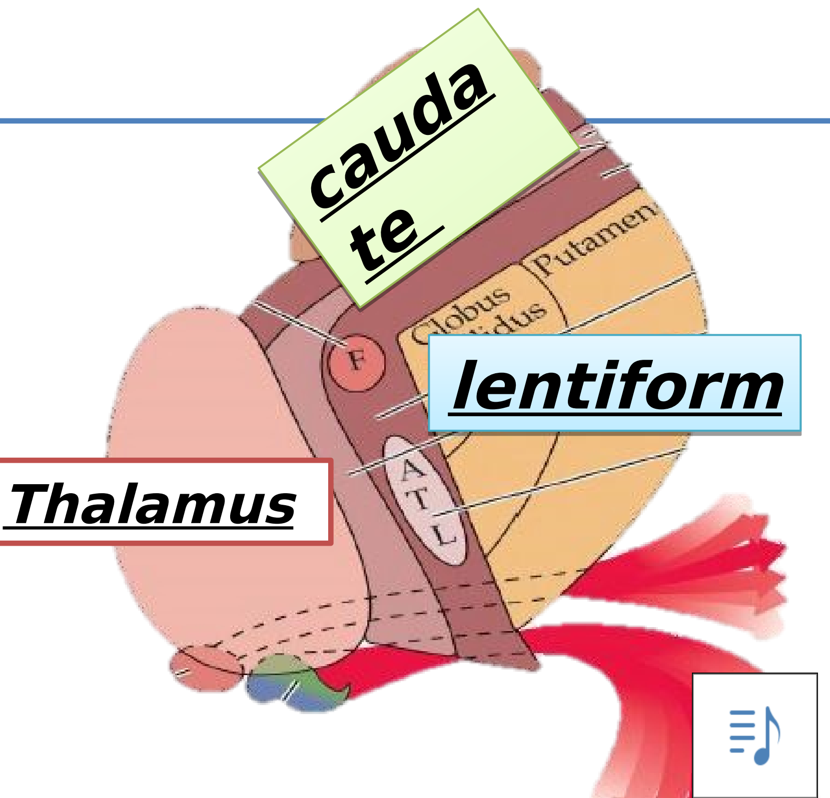
Internal capsu



Internal capsule

A broad band of **projection** fibers running between three masses of grey matter:
Thalamus & ***caudate nucleus*** (medially)
lentiform nucleus
(la

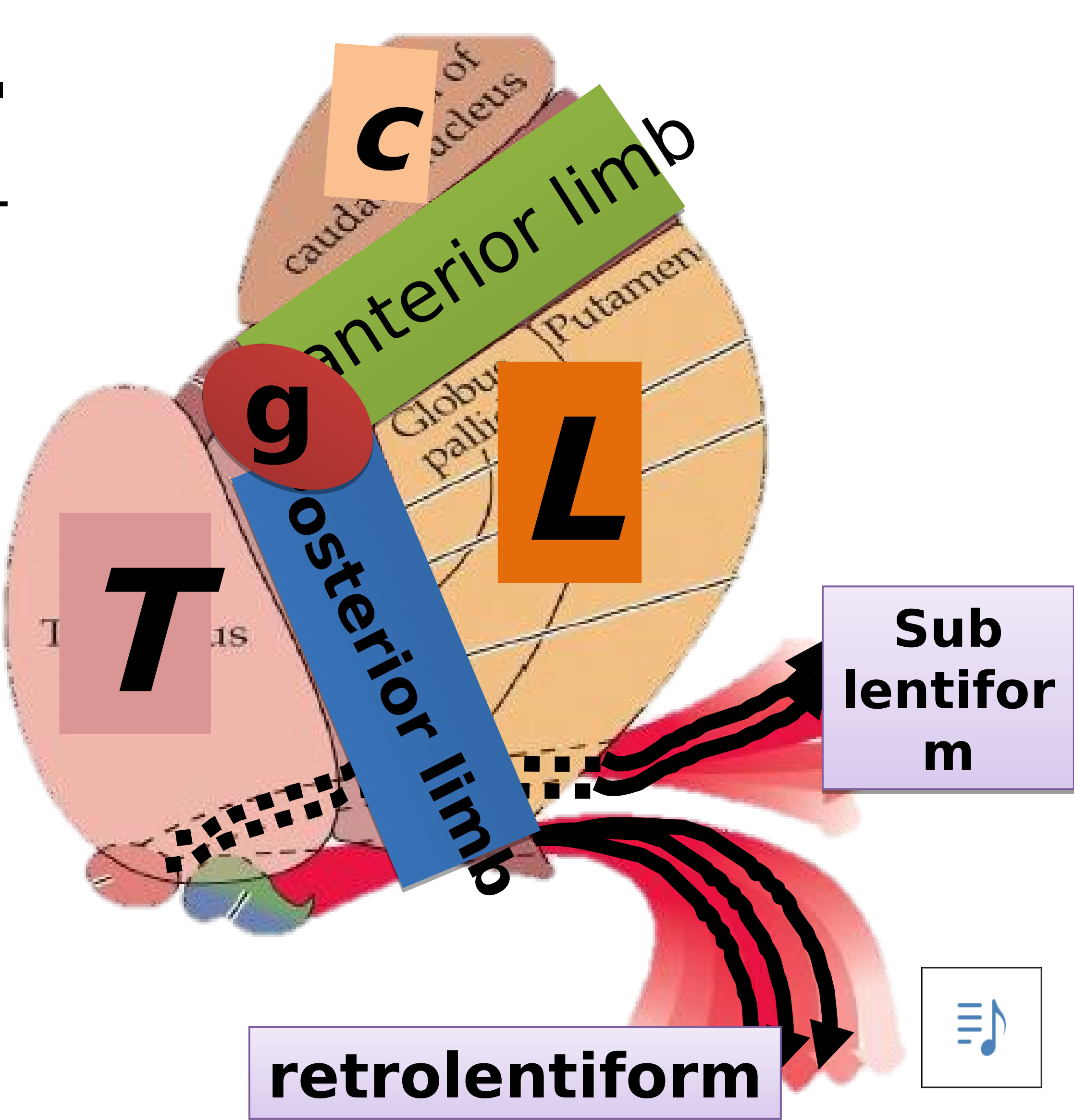


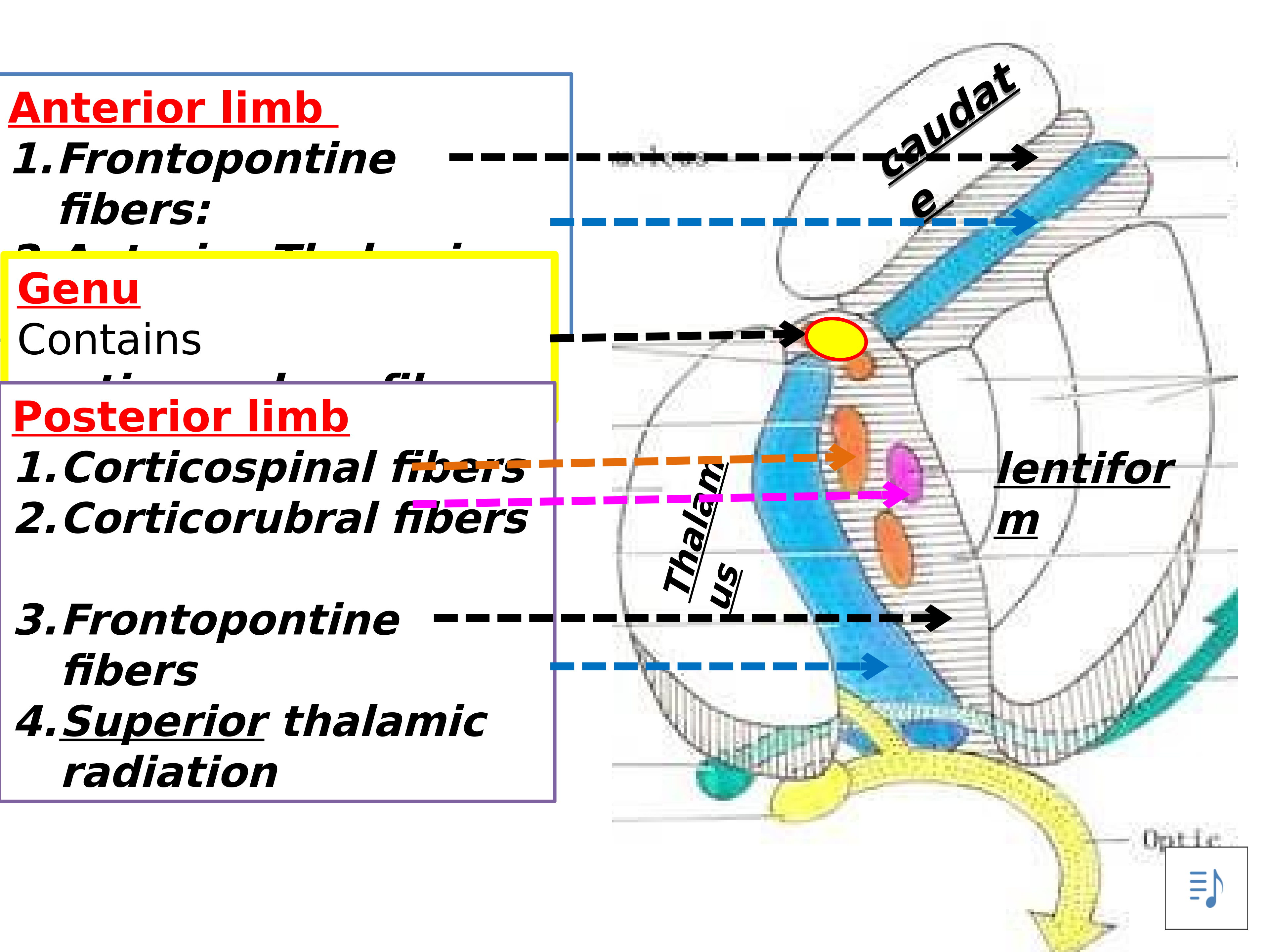


Internal capsule

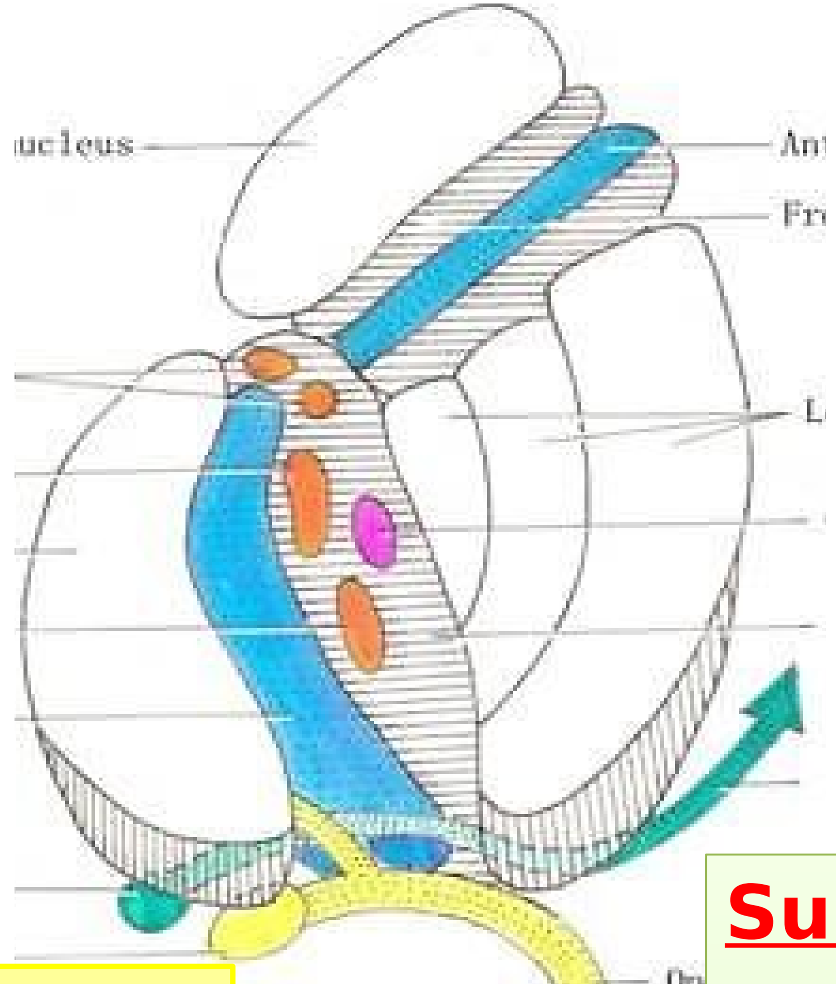
- It is **V-shaped.**
- **It consists of:**

I. anterior limb
II. genu
III. posterior limb
IV. retrolentiform part
V. sublentiform part





Anterior limb
1. Frontopontine fibers:
Genu
Contains
Posterior limb
1. Corticospinal fibers
2. Corticorubral fibers
3. Frontopontine fibers
4. Superior thalamic radiation
caudate
lentiform
Thalamus



Retrolentiform part Posterior thalamic R.

= **(optic radiation)**

(**occipito**-pontine

Sublentiform parts

inferior thalamic R.

= **auditory radiation**

(Temporo-pontine

Projection Fibers

Include fibers that connect the cerebral cortex with lower centers (diencephalon, brain stem, and spinal cord).

It forms the **corona radiata** and **internal capsule.**

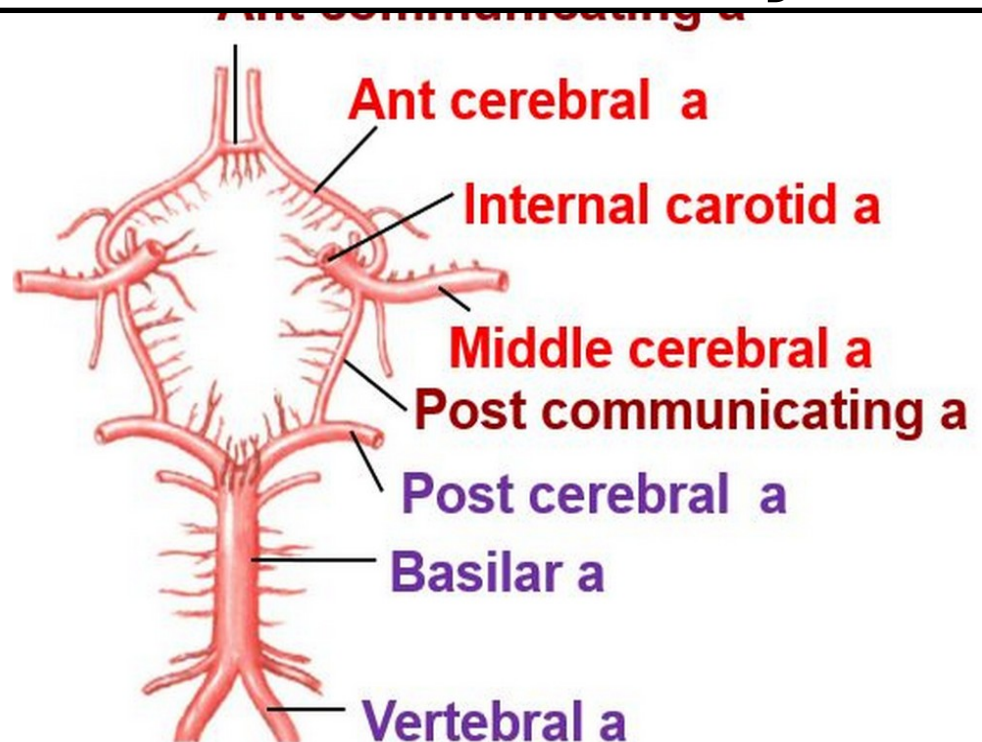
Its fibers are either ascending or descending.

Internal capsule

- A broad band of projection fibers running between three masses of grey matter:
  - Thalamus & caudate nucleus (medially)
  - lentiform nucleus (laterally).
- It is V-shaped, having anterior limb,

Blood supply of internal capsule

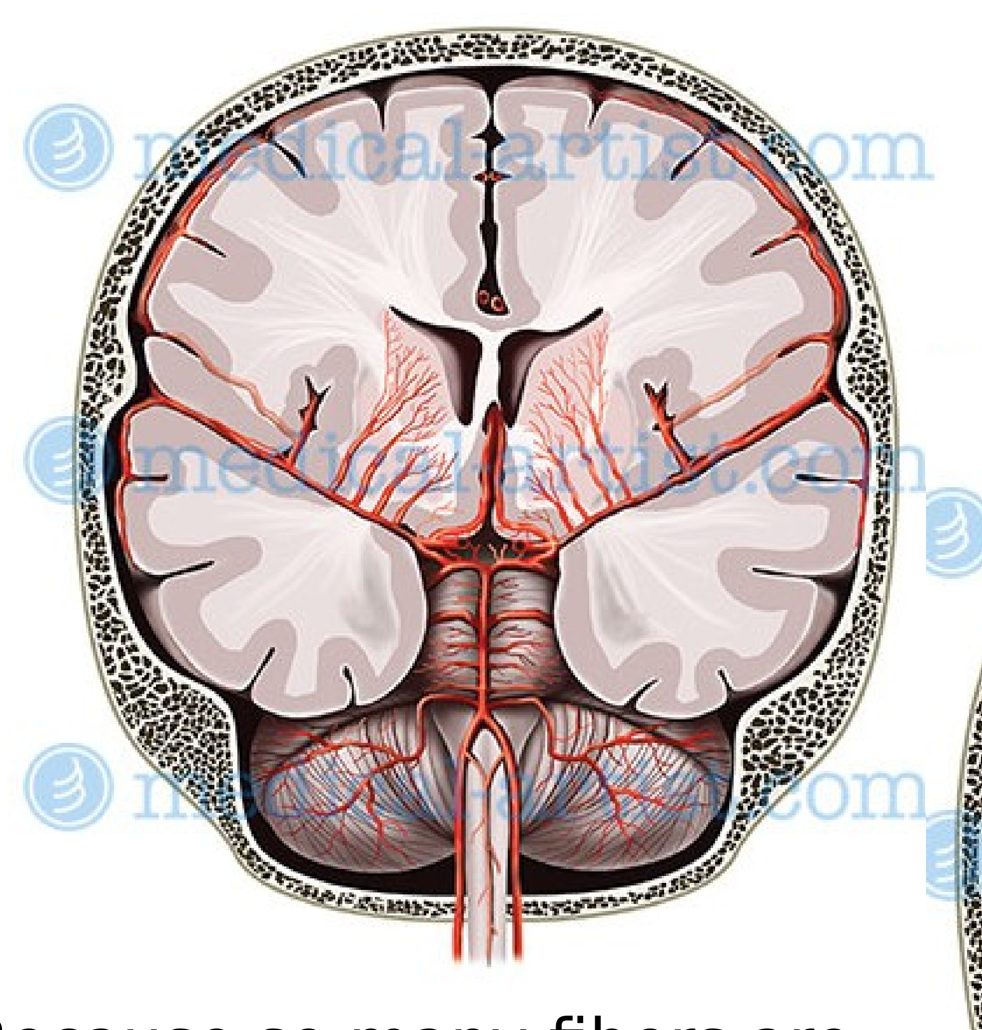
Central branches of **Anterior & Middle cerebral artery**



Ischemic STROKE

Hemorrhagic STROKE

BRAIN **STROKE**



The internal capsule is frequently involved in cerebrovascular accidents

Because so many fibers are grouped in a small area, even a small hemorrhage can cause wide spread effects on the contralateral side of the body



TYPES OF WHITE MATTER OF CEREBRAL HEMISPHERES :

HEMISPHERES :

rojection fibers

Commissural fibers

ssociation fiber



II- Commissural fibers



Inclu... **ng (Same) area**

In the **Two** **Rt. & Lt cere... hemispheres**

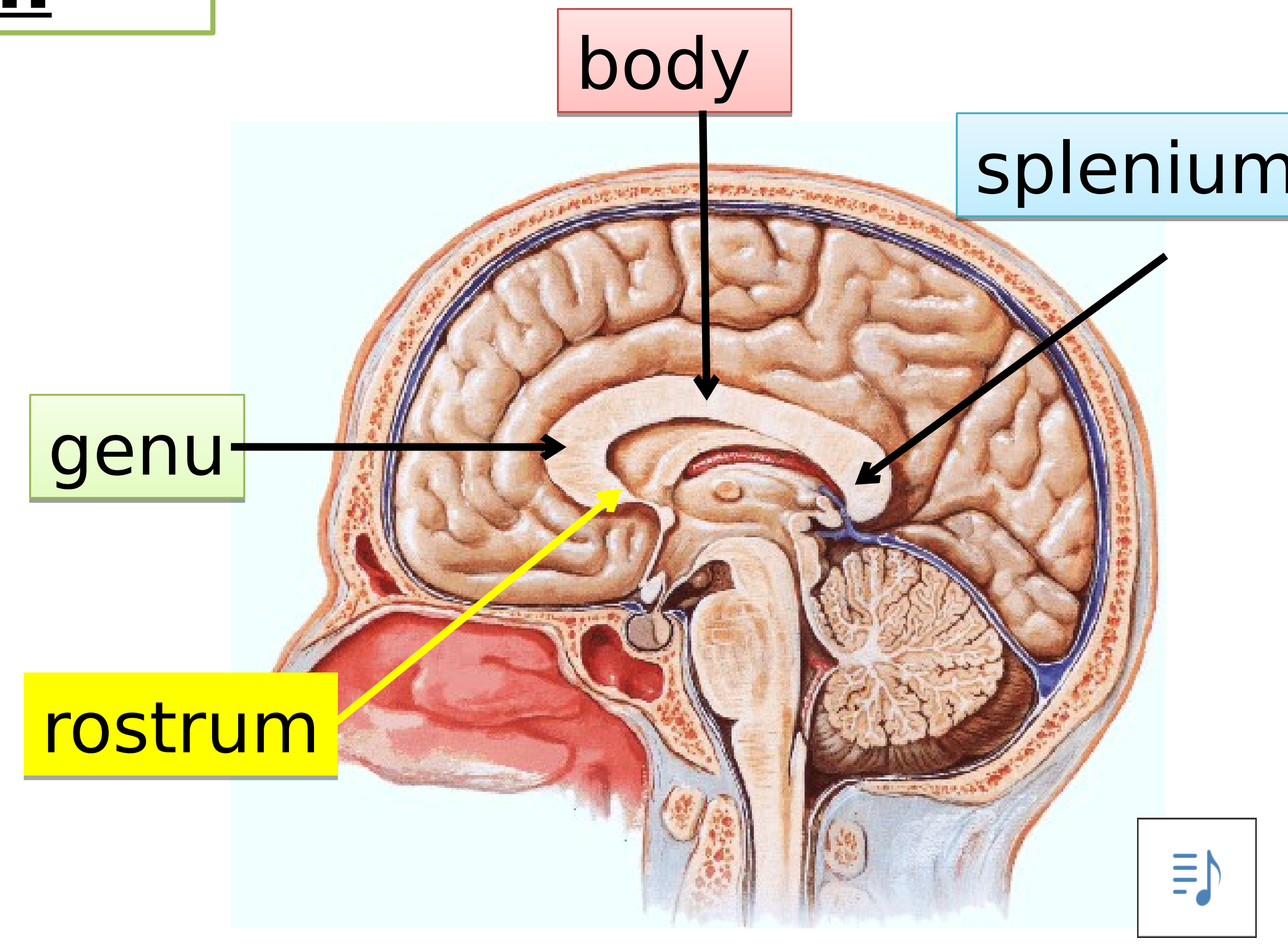
...mid

II- Commissural fibers

1- Corpus callosum

Parts:

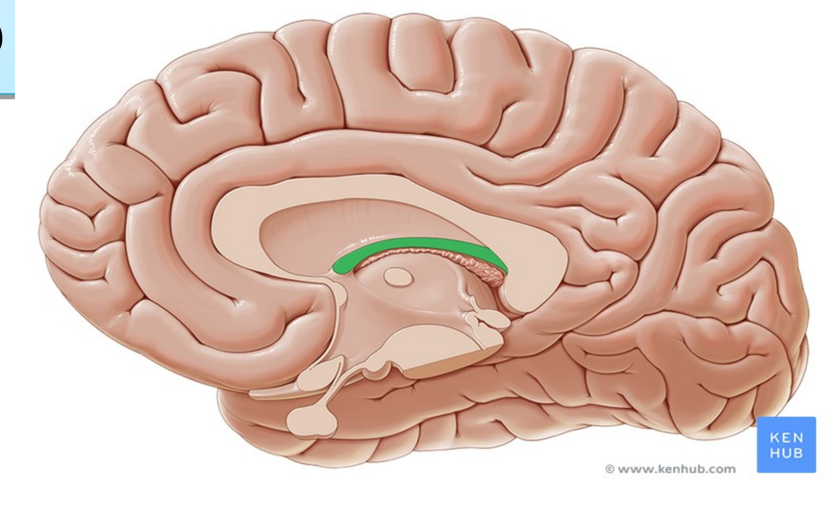
1. Rostrum
2. Genu
3. Body
4. Splenium

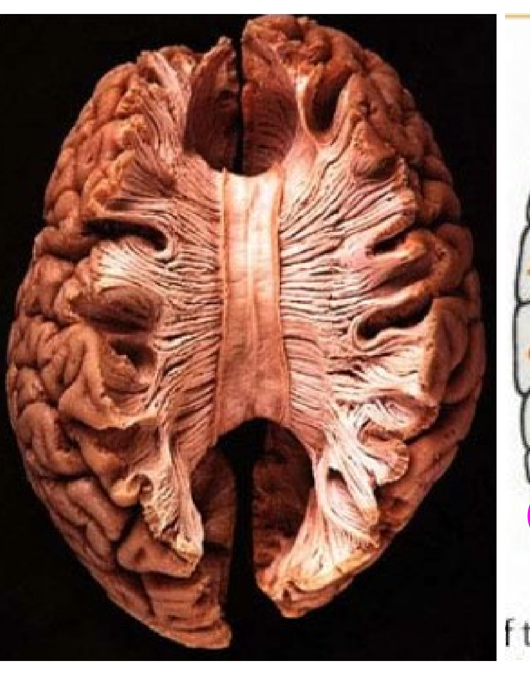


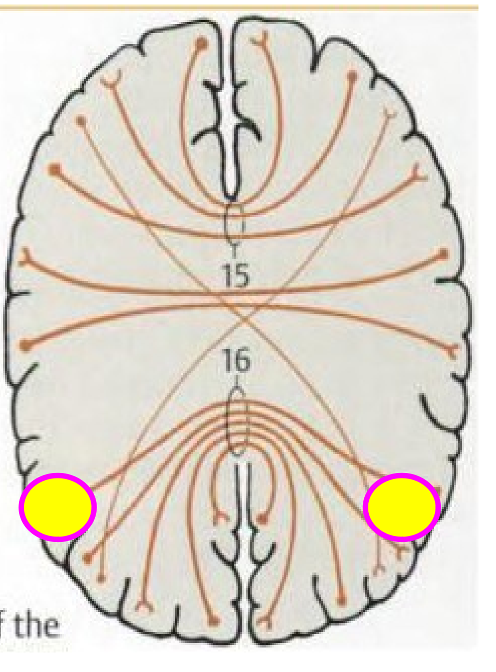
II- Commissural fibers

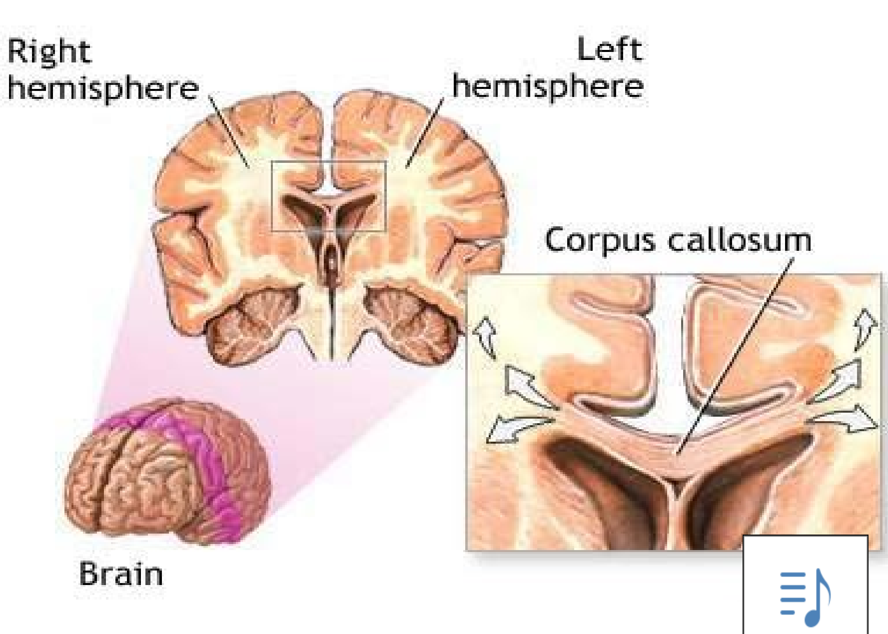
1- Corpus callosum

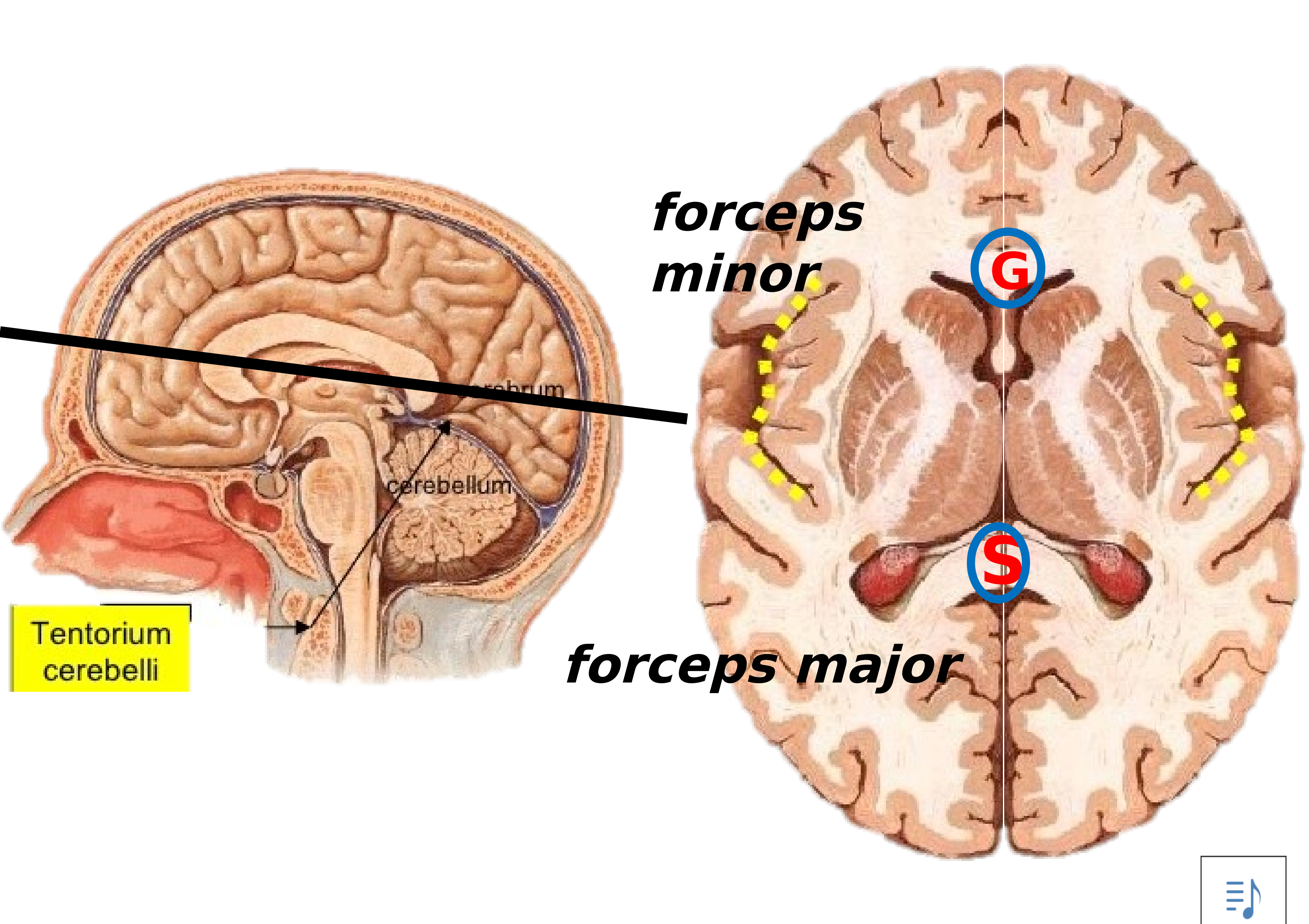
fibers that connect **corresponding area** in **Rt. & Lt hemispheres** **across the midline**










cerebellum
Tentorium
cerebelli
forceps
minor
G
S
forceps major

1-Rostrum:

Connects the orbital surfaces of the two **frontal lobes**.

2. Genu:

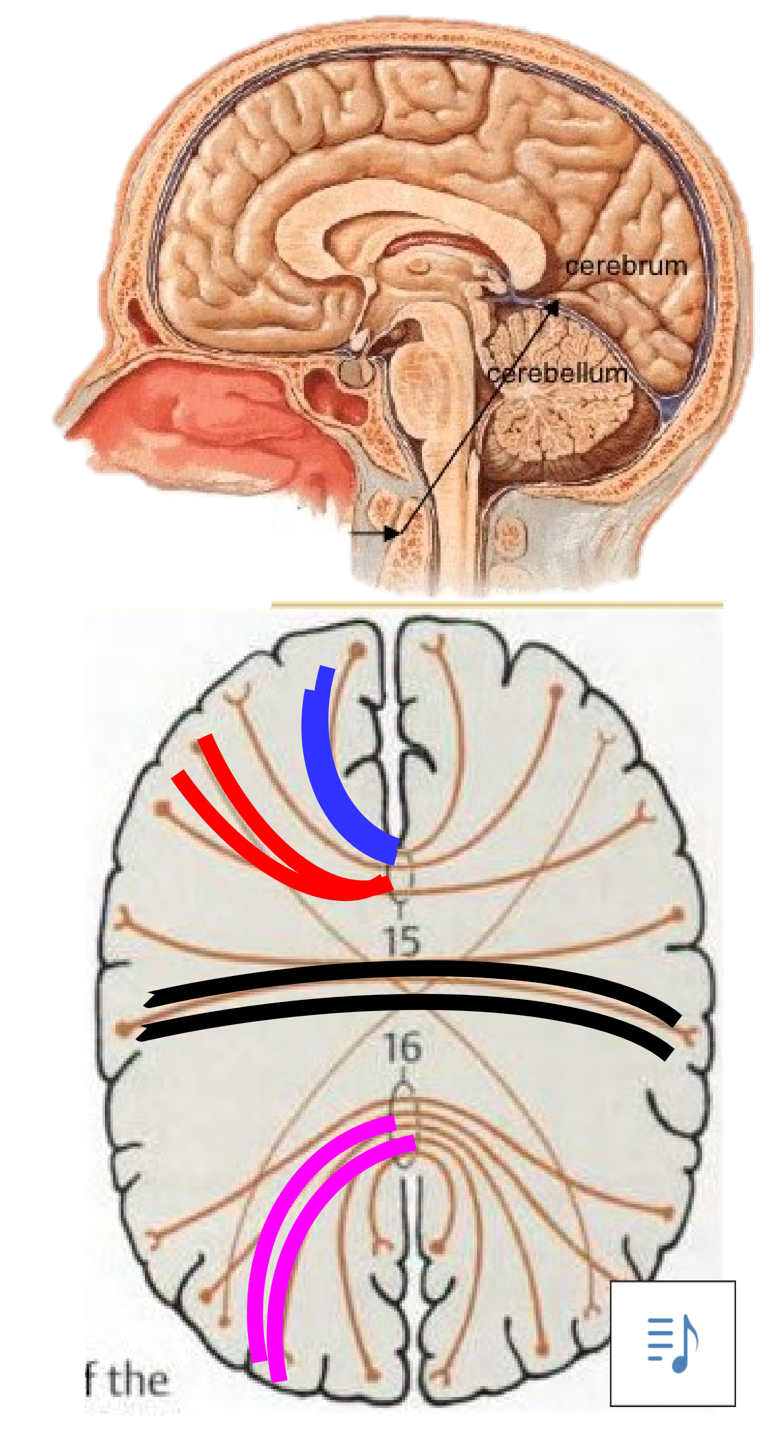
Its fibers form the ***forceps minor***.

Connect the medial & lateral surfaces of the two **frontal lobes**.

3. Body (Trunk):

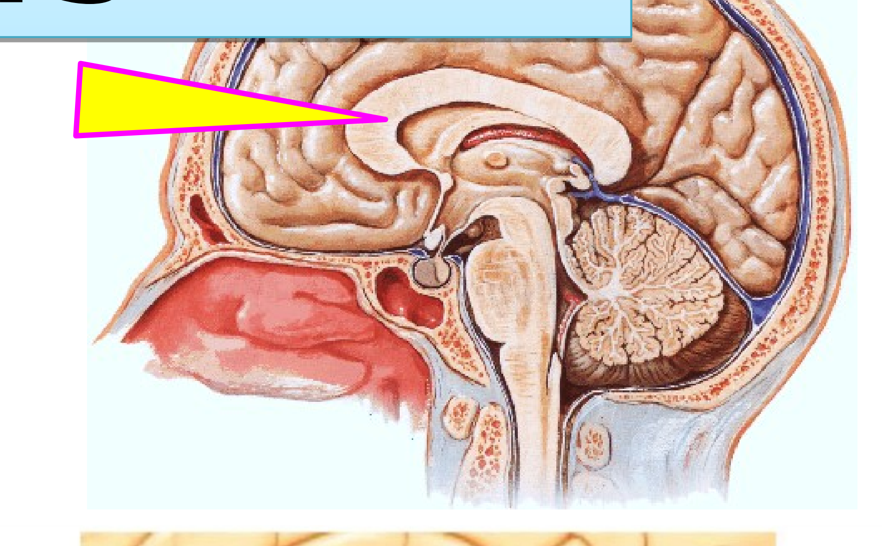
wide areas of cortex (**parietal, temporal** and **occipital lobes)**.

4-Splenium:



II- Commissural fibers

1- callosum



2- Anterior Commissure

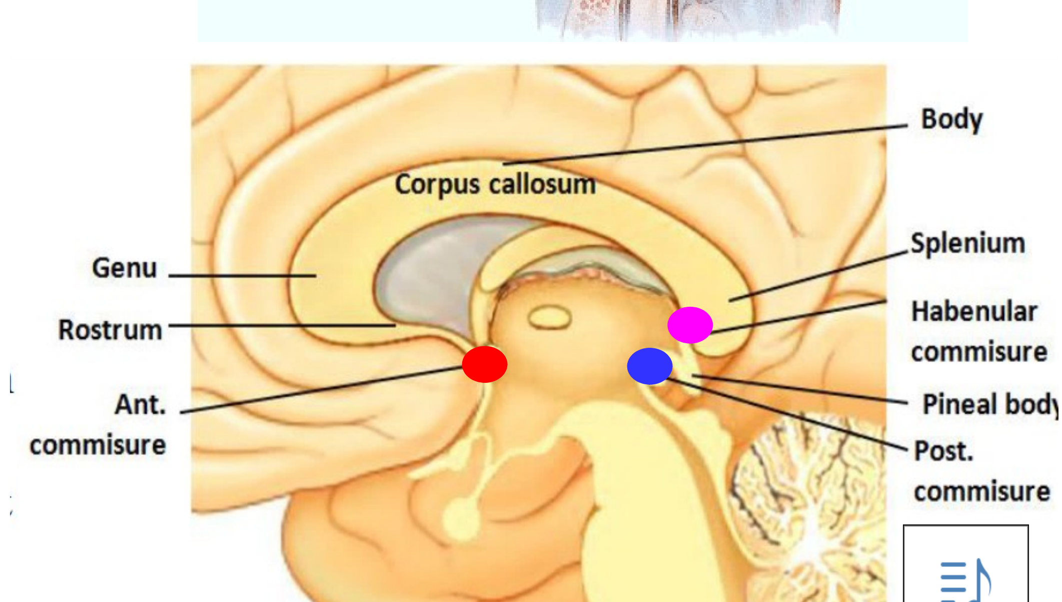
embedded in the lamina terminalis

3- Posterior commissure

embedded in the lower lamina of the pineal stalk

commissure

embedded in the upper lamina of the pineal stalk





Commissural Fibers

Include fibers that connect corresponding area in Rt. & Lt hemispheres across the midline.

They include:

1-Corpus callosum, 2- Ant. Commissure,

3- Post. commissure, 4- Habenular commissure,

5-Hippocampal commissure.

Corpus Callosum

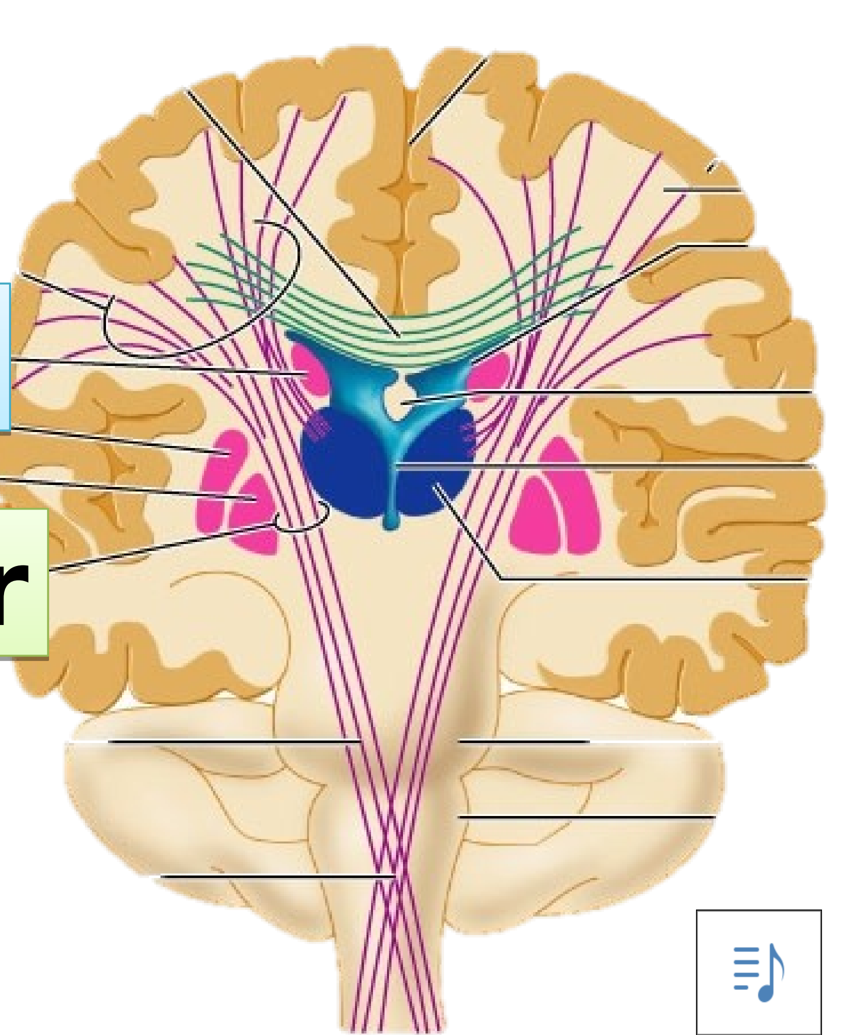
- The largest commissure.
- Relations: o Superiorly: falx cerebri

TYPES OF WHITE MATTER OF CEREBRAL HEMISPHERES :

rojection fibers

ommissural fibers

Association fiber



III- Association fiber



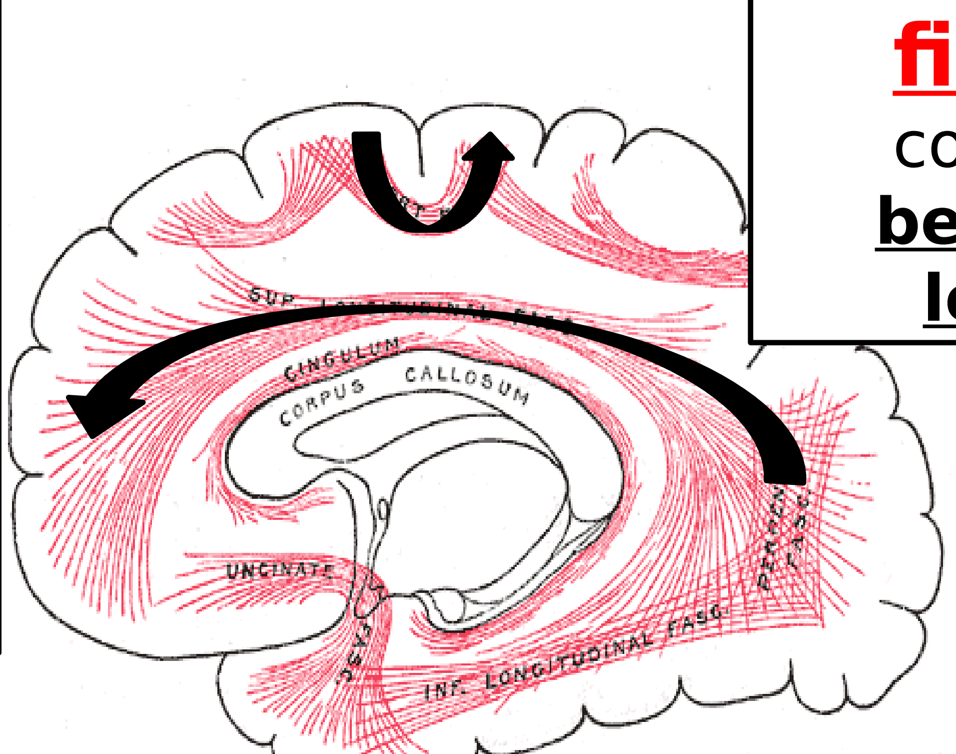
the **same cerebral hemisphere**

(1) short fibers

U-fibers connect **adjacent gyri** in **same lobe** , lie immediately beneath the gray substance of the cortex

(2) long fibers

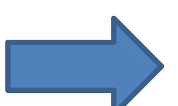
connect **between lobes**





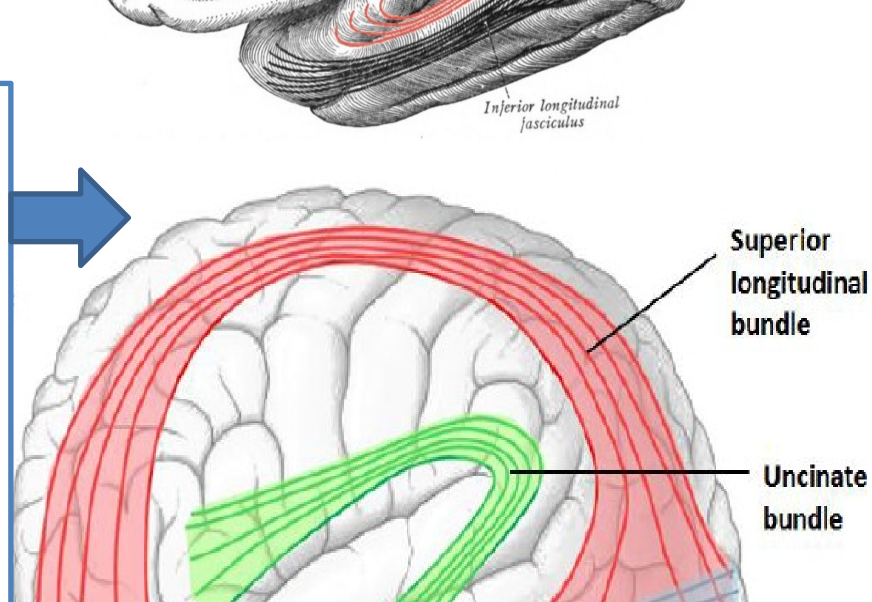
LONG ASSOCIATION FIBERS

1- Cingulum



<u>2- Superior longitudinal bundle</u>

<u>3- Inferior longitudinal bundle</u>



LONG ASSOCIATION FIBERS

- **Superior longitudinal bundle**
  connects frontal lobe to occipital lobe & temporal lobe

- **Fronto-occipital bundle**
  situated deeper to superior longitudinal bundle

- **Inferior longitudinal bundle**
  connects the occipital lobe to the temporal lobe.

- **Uncinate bundle**
  connects Wernicke"s area (in the temporal lobe) to Broca"s area (in the frontal lobe)

Superior longitudinal bundle

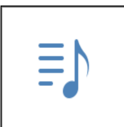
Uncinate bundle

Occipital

Frontal

Temporal

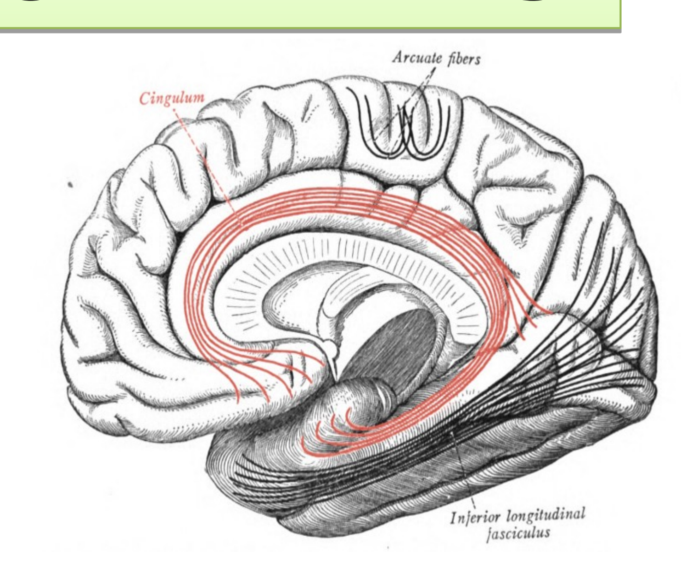
Inferior longitudinal bundle



LONG ASSOCIATION FIBERS

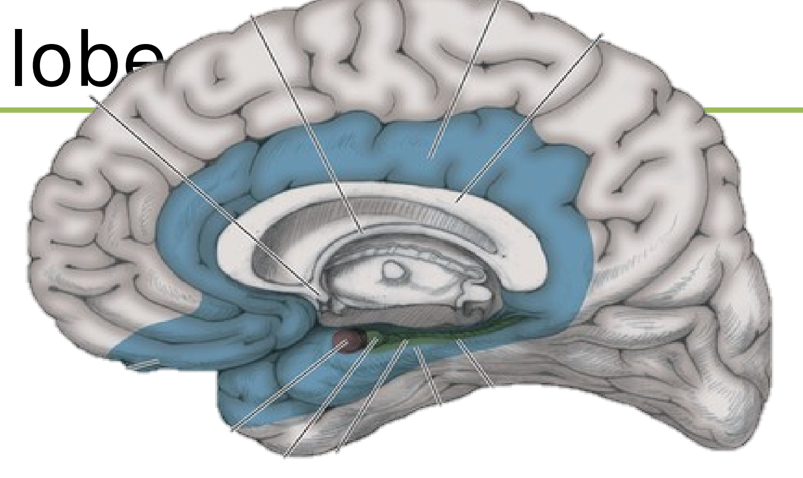
1- Cingulum

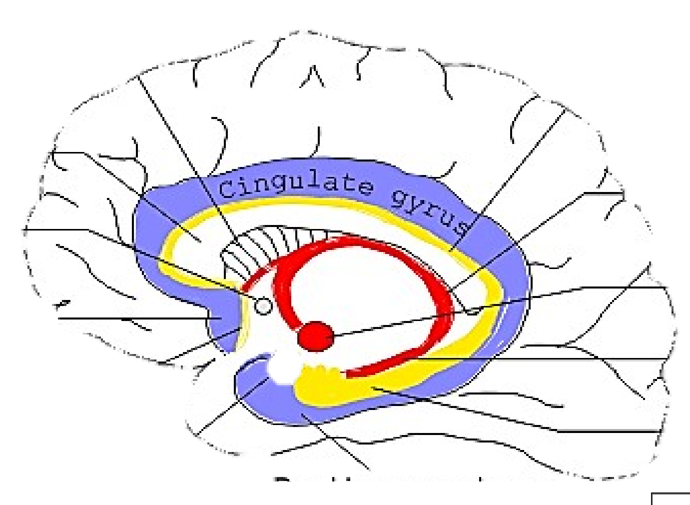




gulate gyrus

- connected to the limbic lobe









Association Fibers :

fibers that connect different regions in the same hemisphere

Short fibers

connect adjacent gyri in the same lobe.

Long fibers:

_connect between lobes.

1. Superior longitudinal bundle: connects the frontal lobe to the occipital lobe and the temporal lobe.
2. Inferior longitudinal bundle: connects the occipital lobe to the temporal lobe.
3. Fronto-occipital bundle: connects the frontal lobe to the occipital and temporal lobes. It runs at a deeper plane than superior longitudinal bundle
4. Uncinate bundle: connects Wernicke‟s area (in the temporal lobe) to Broca‟s area (in the frontal lobe); forming an arch around the lateral sulcus.
5. Cingulum: runs deep to the limbic lobe

BASAL NUCLEI (BASAL GANGLIA)



BASAL NUCLEI (BASAL GANGLIA)

They are masses of **grey matter** lying within each cerebral hemisphere near its base.



BASAL NUCLEI

They include :

I- Corpus striatum

Caudate Nucleus

Lentiform Nucleus

II - Amygdaloid Nuclei

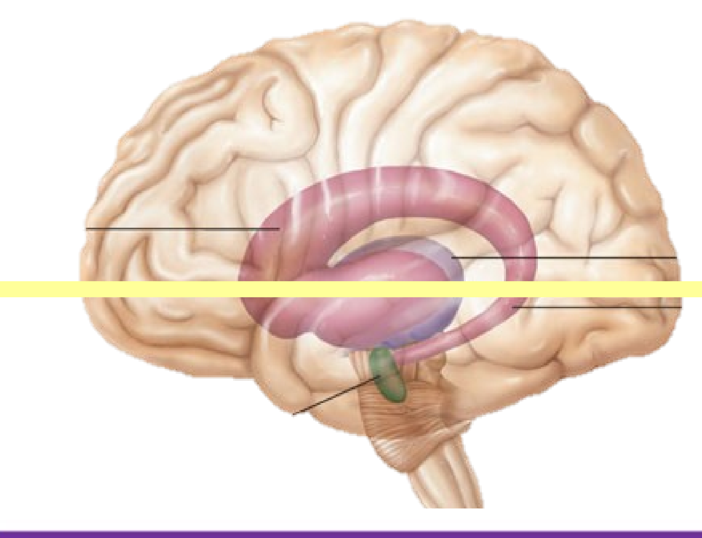
III - Claustrum

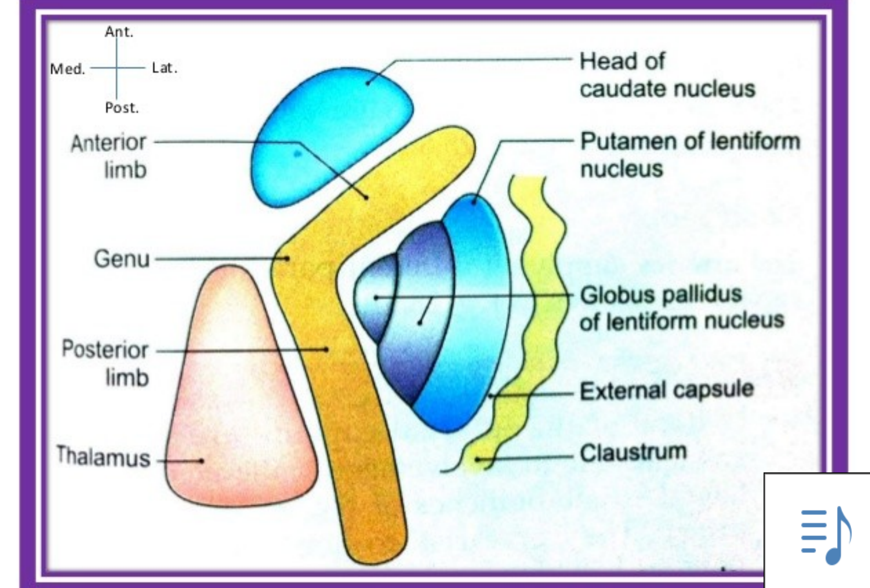
(grey matter that lies lateral to Lentiform N

(a)

BASAL NUCLEI

C
L
T



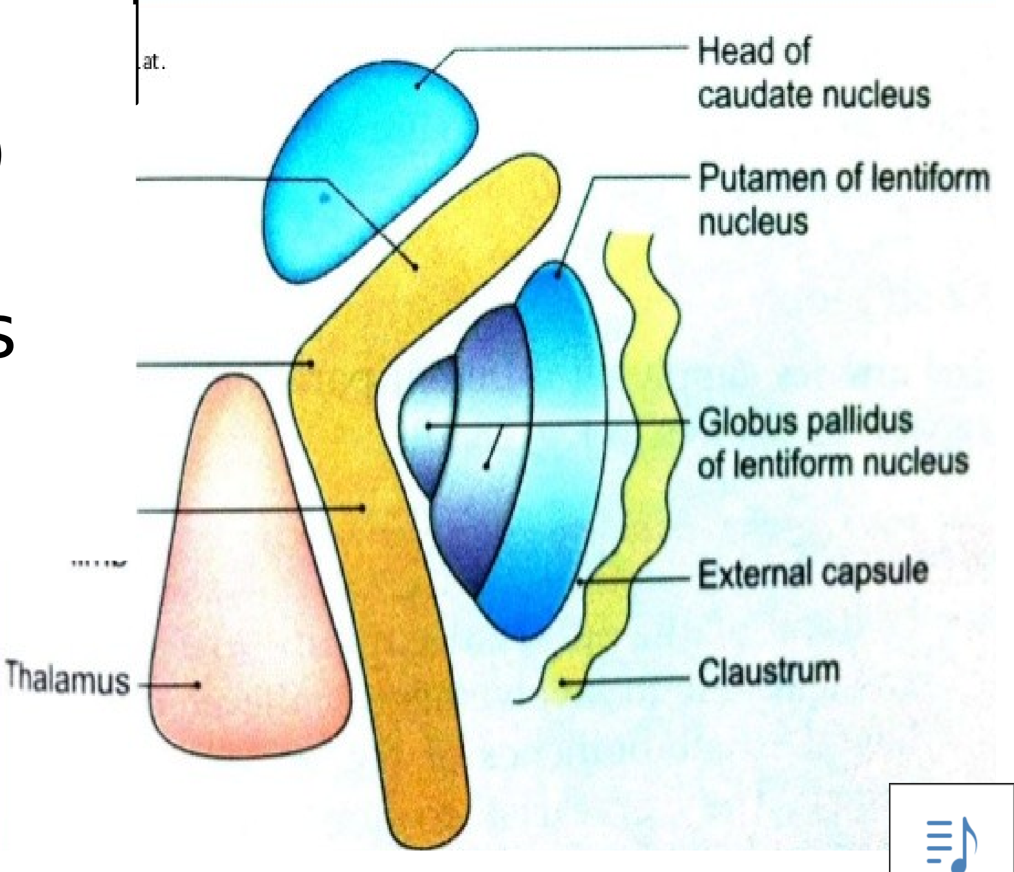


BASAL NUCLEI

Lentiform

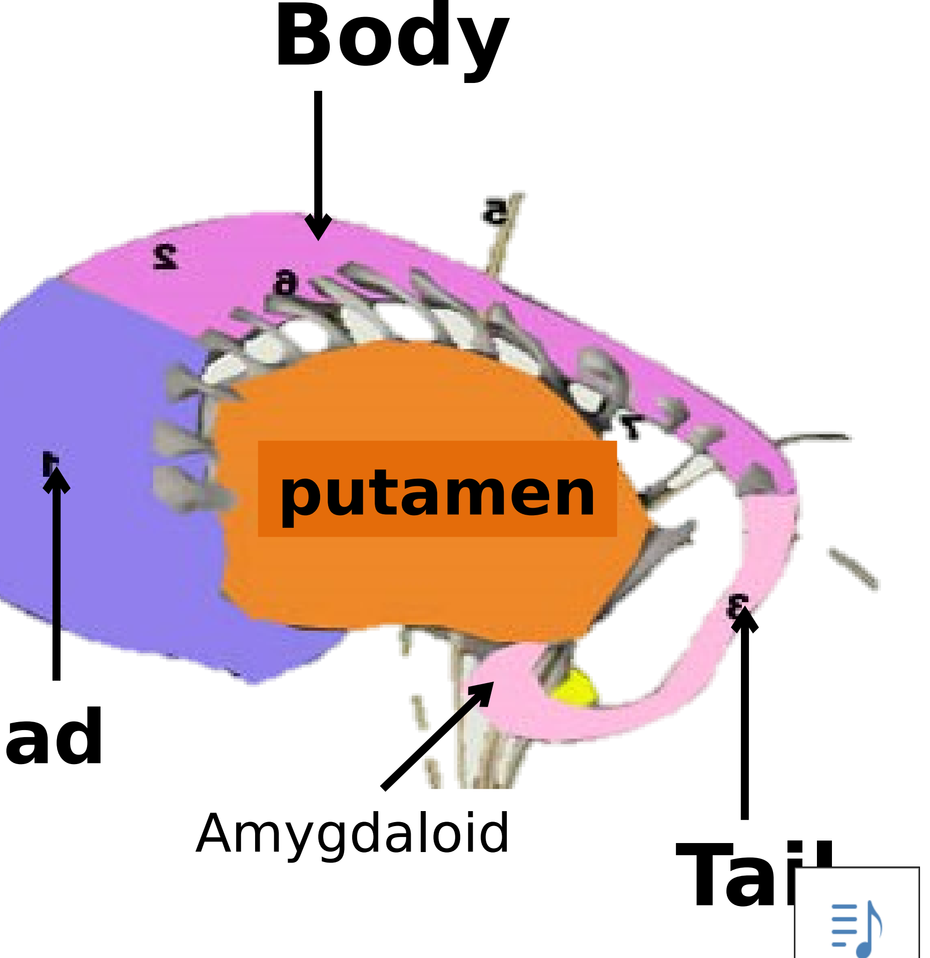
It is divided into:

- Putamen (laterally)
- Globus Pallidus (medially): appears white due to rich myelin content.



Caudate Nucleus

- It is a **C-shaped Nucleus**
- It has a **head, body and tail**
- The head is continuous with putamen of lentiform N.
- The tip of the tail is continuous with the amygdaloid nuclei.

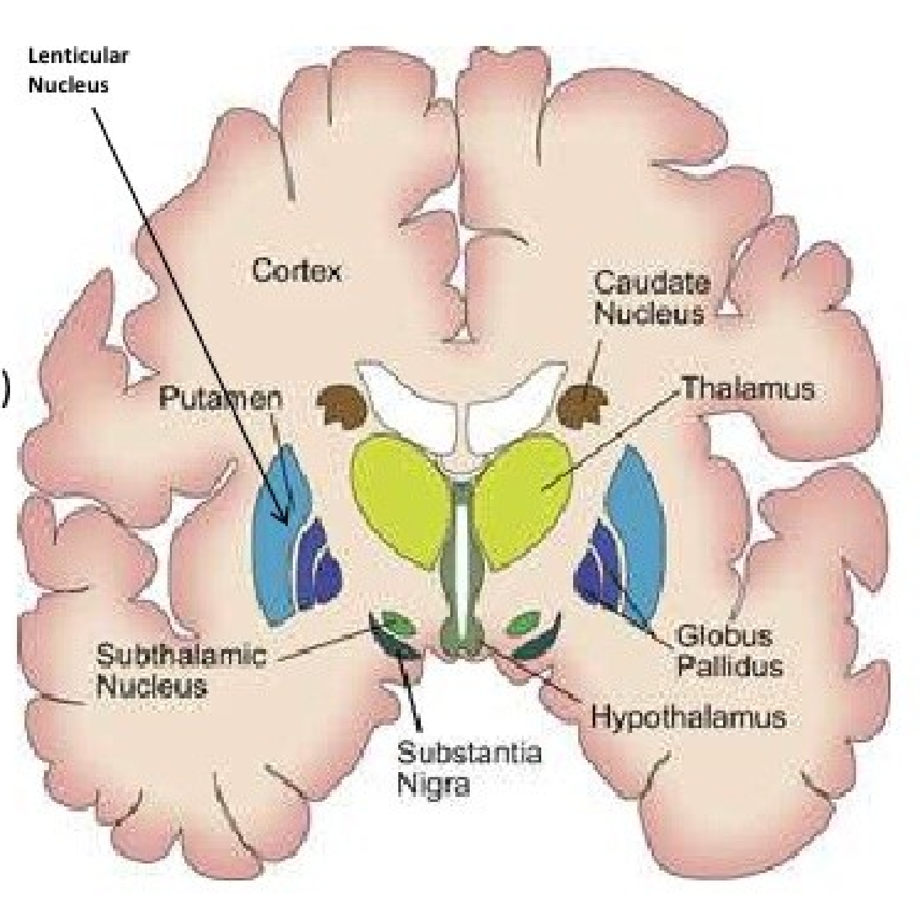


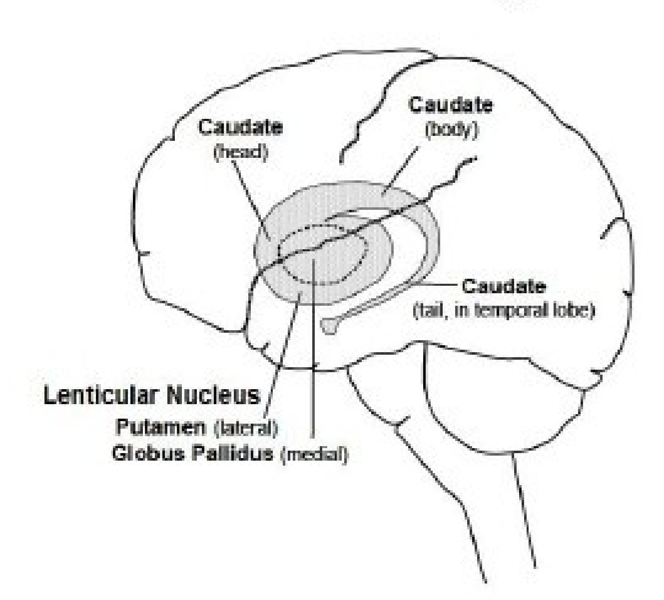
Caudate Nucleus

- **The head** bulges into the **anterior horn** of the **lateral ventricle**
- **Its body** lies in the **floor of the body** of lateral ventricle.
- **Its tail** lies in the roof of the **inferior horn** of latera

FUNCTIONAL DIVISIONS

1. **Striatum**
   a. caudate nucleus
   b. putamen
2. **Pallidum**
   a. Globus Pallidus Interna (Gpi)
   b. Globus Pallidus Externa (Gpe)
3. **Thalamus**
4. **Subthalamic Nucleus**
5. **Substantia Nigra**








thank you
© 1996, 2002 SANRIO CO., LTD.